DOCUMENT RESUME

ED 230 644 UD 022 801


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TITLE Effects of Student Teams and Individualized Instruction on Cross-Race and Cross-Sex Friendships.

INSTITUTION Johns Hopkins Univ., Baltimore, Md. Center for Social Organization of Schools.


SPONS AGENCY National Inst. of Education (ED), Washington, DC.
PUB DATE 83
GRANT NIE-G-78-0210
NOTE 25p.; Paper presented at the Annual Convention of the American Educational Research Association (Montreal, Quebec, Canada, April 11-14, 1983).
PUB TYPE Reports - Research/Technical (143) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Blacks; Elementary School Students; *Friendship; Intermediate Grades; Mathematics Instruction; *Peer Relationship; Racial Attitudes; *Racial Relations; Sociometric Techniques; *Student Attitudes; *Teamwork; Whites
IDENTIFIERS Baltimore City Public Schools MD; Cross Race Interaction; Cross Sex Friendship; *Team Assisted Individualization



ABSTRACT

A sample of 160 fourth, fifth, and sixth grade students in a Baltimore City (Maryland) magnet school participated in an experimental study on the effects within cross-race and cross-sex friendships on a mathematics program that used Team Assisted Individualization (TAI). TAI is an instructional method that combines individualized instruction with cooperative learning. Children of different race, sex, and achievement levels worked in small teams on individualized materials. Team members depended on one another for skill checks and were encouraged to assist their teammates with problems. Members' performances counted toward a team score, and teams that met certain preset standards were rewarded. Pretest and posttest scores on two sociometric instruments and two peer rating scales were compared with measures for a control group. Results indicated that: (1) compared to students in the control group, those in the experimental group demonstrated greater increases in cross-race friendships, and fewer rejections of peers from other races; (2) experimental group students less frequently rated students of other races or of the opposite sex as "not nice"; and (3) positive effects of TAI on cross-race friendships appeared to be due primarily to reductions in negative attitudes of white students toward black students. (MJL)



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# Effects of Student Teams and Individualized Instruction on Cross-Race and Cross-Sex Friendships

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Paper Presented at the Annual Convention of the American Educational Research Association, Montreal, 1983.

This research was supported by a grant from the National Institute of Education, NIE-G-78-0210. However, the opinions expressed are those of the authors and do not represent NIE policy.

The authors wish to thank the staff and students of Roland Park Elementary School, Baltimore, MD, for their help with this project.

## Abstract

Title: Effects of Student Teams and Individualized Instruction on Cross-Race and Cross-Sex Friendships.

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This study explored the effects of a mathematics program which combines individualized instruction with cooperative learning, called Team-Assisted Individualization (TAI). Children of different race, sex and achievement levels worked in small teams on individualized materials. Their performance counted towards a team score, and they were rewarded as a team if they met certain preset standards. Teammates depended on each other for skill checks and were encouraged to assist each other with problems.

One hundred sixty upper-grade students in seven urban elementary school classes were included in the study. Sixty-six % were black, 34% white. Classes were assigned at random to the experimental (TAI) program and to a control condition which consisted of the regular mathematics program. A randomized experimental pre- posttest design was used with several sociometric measures to assess treatment effects.

Experimental students were found to increase more in cross-race friendships, and their rejections of other-race peers was significantly lower than those of the control group. They also rated other-race and other-sex classmates less often as "not nice." An interaction effect between treatment and race was found, with treatment effects for white attitudes toward blacks, but not for black students toward whites.

Effects of Student Teams and Individualized Instruction
on Cross-Race and Cross-Sex Friendships

Research on the effects of desegregation on race relations in schools has generally confirmed Allport's (1954) "contact theory," in which he outlined the prerequisites for successful integration. Allport stressed the need for equal status contact between individuals of different races, for a classroom structure that encourages frequent, cooperative interactions between students, and for common goals to give children a common identity and thus reduce prejudice. He argued that simply placing children of different ethnic backgrounds in the same school or classroom would lead at best to "merely desegregated" rather than integrated schools (Pettigrew, 1975) and would do little to destroy sterotypes or to develop friendly attitudes between black and white students. Early desegregation research confirms this view. It produced inconsistent and on the whole disappointing results (St. John, 1975). Few of the positive effects hoped for in terms of appreciable achievement gains for blacks or a lessening of racial cleavage have been observed (Weinberg, 1975). Where genuine integration was found, conditions resembled those mandated by "contact theory." Open classrooms, with built-in opportunities for frequent, task-oriented interactions, for example, had measurable positive effects on interracial relationships (Hallinan, 1976), while approaches like minority study programs, teacher workshops and multiracial teaching materials were rarely more than marginally effective in changing racial prejudices (Slavin and Madden, 1979).

Within the past ten years, a variety of intervention techniques have been developed that focus on ways to truly integrate minority students in

the classroom. These techniques all use small, multiracial learning teams, in which students work together and are rewarded, at least to some extent, on the basis of their group performance (DeVries and Edwards, 1974; Weigel, Wiser, and Cook, 1975; Slavin, 1977; Aronson, 1978). These cooperative learning techniques, in which students can contribute equally to a group product, tend to equalize status (Amir, 1976) and produce interdependence, which fosters group cohesion. A common goal structure is an important part of cooperative team learning techniques. The positive affect within the group intensifies with increased group incentives to succeed (Slavin and Hansell, in press).

Recent research and cooperative intervention programs are based on the assumption that social relations and academic achievement are not separate entities for which different techniques or conditions are needed. Instead, there is widespread agreement that there is a strong interrelation between them, with peer relations as the mediator for increased achievement (Johnson and Johnson, 1974, Bossert, 1979).

The positive effects of cooperative learning models have been relatively consistent both for increasing student achievement and for increasing cross-racial friendships (see Slavin, 1983). However, there is one important problem that remains to be solved. Teachers in desegregated classrooms are often faced with an increase in the range of achievement levels of their students. Existing cooperative learning methods are not well suited for teaching students who vary widely in performance level, as they all involve teaching all students the same material at the same rate. This is especially problematic

in such subjects as English or mathematics, which are hierarchical in nature (i.e., each skill builds on previous skills).

One of the methods used for dealing with the problem of academic heterogeneity in the classroom, individualized instruction, has proven unsatisfactory in terms of increasing student achievement (Miller, 1976; Schoen, 1976). It also tends to keep contact opportunities to a minimum and thus isolate children, perhaps exacerbating racial cleavage. In schools that use ability grouping or tracking to reduce heterogeneity, the results have been virtual resegregation (Schofield, 1979), with a concomitant reduction in social interactions between ethnic groups.

In an attempt to combine the positive features of cooperative learning with the advantages of individualized instruction in elementary mathematics, a new method has been developed at the Johns Hopkins Center for Social Organization of Schools (Slavin, Leavey and Madden, in press). It is called Team Assisted Individualization (TAI).

In TAI, students are assigned to 4-5 member teams which reflect the class composition as far as race, sex and achievement levels are concerned. Students work on individualized curriculum materials. A pretest determines the appropriate starting point in the individualized program. Students work through the materials at their own pace. There are frequent, built-in checkpoints, and a student's work is checked at every step by teammates. Team members who are working on more advanced materials are encouraged to provide assistance to slower peers before the teacher is called on for help. Students take final tests on their units outside of their teams.

The number of units a student completes is entered into a team score sheet and teams are rewarded with team certificates based on the number of units completed per week and the accuracy of the units. Teachers function in part as tutors for individual students for questions that cannot be solved within the team. They also pull together children from different teams who are working at the same level and instruct them as a group for short periods several times per week. The TAI program is interrupted every three weeks by a week of whole-class instruction. During that time, subjects are dealt with that do not require so much previous knowledge, such as measurement and geometry. New teams are formed after every four week cycle to ensure intensive interactions with as many classmates as possible.

The achievement effects of this approach have been found to be positive (Bryant, 1981; Slavin, Leavey and Madden, 1982), but the impact of this new technique on inter-group attitudes has not yet been determined. The question is whether such an individualized program retains enough team interaction and cohesion to produce beneficial socializing effects similar to those seen in the other team-based approaches (Slavin, 1981).

There is ample evidence that group membership and personal characteristics mediate social outcomes. Apart from race, sex has consistently been found to influence interracial friendship patterns. In fact is is a larger factor of social cleavage than is race (Criswell, 1937; Carithers, 1970; Carter, et al., 1975). Girls tend to interact in smaller groups than boys and exhibit a greater tendency towards racial encapsulation than boys (Damico, 1975; Francis and Schofield, 1980).

There are also suggestions that sex and race interact with various learning techniques. Cooperative learning is hypothesized to be more effective for boys than for girls (Crockenberg et al., 1976) and for black children than for whites (Kagan, 1979). Research results seem to support a hypothesis of differential effects, though they are not consistent over age and variations of team-learning approaches. However, in the light of the potential role of gender in mediating social outcomes (Sagar and Schofield, 1980) and in the light of previous research results, it seems important to look at the cross-sex as well as the cross-race effects of a new cooperative technique, and to examine its effects on different ethnic groups.

## Method

### Subjects

The research sample was composed of 160 students in two fourth, two fifth and three sixth grades. Of these 106 (66%) were black, 54 (34%) were white. The students attended mathematics classes in a Baltimore City combined elementary/junior high school. Four black teachers administered the experimental (TAI) treatment, two black and one white teacher the control treatment. All teachers were female.

The school in which the study was conducted lies within a white, upper-middle class neighborhood. In addition to middle-class white students from the surrounding neighborhood and predominantly lower-class black students from adjacent areas, the school draws its population from the city as a whole as a magnet for high achieving students. The classes, especially in the upper elementary grades, are therefore mainly composed of chidlren whose only contact is in school.

Design

The study employed an experimental-control group design. The scores of students on the California Achievement Test were averaged for each of the classes. Classes were assigned at random to one of the treatment conditions, but in such a way that high and low achieving classes were balanced between treatments. There were 83 children (35% white, 65%) assigned to the experimental (TAI) group and 77 children (32% white, 68% black) to the control group. The experimental classes ranged from 44% to 80% black students, the control classes from 59% to 80%. The statistical analysis was adjusted to take into account the varying racial ratios and different proportions of males and females in each class.

The program was in effect for sixteen weeks during the second semester of the school year. Each class was taught mathematics during one hour of each school day. Experimental teachers were trained in the use of the experimental program during a three-hour seminar. They also received a teacher's handbook and assistance in the classroom during the first weeks of implementation. Teachers of the control group were given no special attention and simply continued to teach the regular mathematics program to their students. To diminish possible Hawthorne effects, the training emphasized achievement, rather than intergroup relations as the principal focus of the research. The learning teams in the experimental (TAI) classes were made up by the research team with an overt stress on balancing them by achievement levels, and students were not made aware that race relations were being measured.

Treatments

Control: The control children continued to follow the regular mathematics program.

Team-Assisted Individualization (TAI): In the experimental treatment, students were taught with the TAI technique as described earlier. The children were assigned to 4-5 member teams. Each team represented a cross-section of the class as far as race, sex and achievement were concerned. The team assignments were made without taking into account any preexisting friendships, and new teams were made up every four weeks to assure interaction between a maximum number of classmates.

Teams sat together, chose a team name, and posted a team score sheet on which the number of individualized units each team member completed were entered. Extra points were awarded for accuracy. Team rewards, in the form of certificates, were offered for teams who met certain preset standards for completed work each week. Students worked in their teams on units in which mathematics skills were broken down into steps. Team members depended on each other for skill checks at each step. Teammates were encouraged to help each other with problems and to only call on the teacher if they could not answer each other's questions.

Measures

The measures of inter-group relations used in this study were two sociometric instruments and two rating scales administered as pre- and posttest. The sociometric questions were, "Who are your friends in this class?" (in-class friendships), and "Who would you rather not sit at the same table with?" (rejections). The rating scales were presented in the form of class rosters containing the following questions, "How smart do you think this child is?" and "How nice do you think this child is?" Three options were given, of which one was to be checked for each student on the list. The opitions were, "very nice," "a little nice," "not at all nice," and "very



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smart," "a little smart," "not at all smart." The answere were scored 3, 2 and 1 respectively. Only the results of the extreme positive and negative answere are reported, because changes in the middle answere chould have arisen from shifts in either direction.

Results

In analyzing the results of the sociometric choices, the number of choices received by each student from classmates of the other race (cross-race) or sex (cross-sex) were divided by the number of classmates of the other race or sex respectively. Thus, the scores for each student represent the proportion of cross-race and cross-sex choices received to those possible. In the rating scales the number of positive and negative assessments received from classmates of another race or sex were similarly divided by the number of other-race or other-sex raters.

The data were analyzed by means of analyses of covariance with pretests as the covariates for their respective posttests. In the first analysis, the cross-race and cross-sex choices of all children were considered. The dependent variables were the proportions of cross-race and cross-sex choices received on the sociometric measures and the ratings received from other-race and other-sex children. The independent variable was treatment.

In a second analysis, ratings of other-race and other-sex classmates were looked at within each racial group. The statistical analysis was the same as that for the total groups. Table 1 summarizes the results for the cross-race analysis of choices received of all children in the two groups on all four tests. Table 2 contains the same information but for cross-sex choices. Table 3 presents the results of the rating scales for choices



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received by white children both from other-race and from other-sex peers, and Table 4 gives the same information for choices received by black children.

Cross-race analysis

Statistically significant results were found for both of the sociometric measures. On in-class friendship choices, both groups show an increase from pre- to posttest, but that of the treatment group is significantly greater ($F(1,157) = 3.965$, $p < .05$). The number of rejected children rose for the control groups and dropped for he experimental groups for a highly significant difference between the groups ($F(1,157) = 18.233$, $p < .001$). On the rating scales, the "not nice" question shows measurable differences between the groups. Again, the control group increased somewhat in its negative assessments of classmates, while that of the experimental group decreased ($F(1,157) = 6.148$, $p < .014$).

Cross-sex analysis

The treatment effects on cross-sex relationships were less pronounced than those for cross-race interactions. Only the "not nice" ratings produced a significant difference. The trend was the same as that for the cross-race ratings. The control group judged other-sex peers more negatively over time, while in the experimental groups, negative assessments decreased ($F(1,157) = 14.249$, $p < .001$).

Within-race analyses

White children: A separate analysis of ratings of white children by other-race and other-sex classmates shows no treatment effect.



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Black children: There are treatment effects both for the cross-race and for the cross-sex ratings received by blacks. In both analyses they appear on the "not nice" measure. Black experimental children were rated less negatively by white experimental children than were blacks in the control group ($F(1,103) = 8.328$, $p < .005$). They also received fewer negative ratings on this scale from other-sex peers ($F(1,104) = 14.960$, $p < .001$).

These results suggest a possible race/treatment interaction, and factorial analyses (Treatment by race by sex) were run to examine this possibility. None of the cross-sex relationships showed race/treatment interactions. For cross-race choices, a strong race/treatment interaction effect was found for the rejection measure only ($F(1,151) = 11.066$, $< .001$).

Discussion

The results of this study indicate that a combination of cooperative learning and individualized instruction, TAI, has positive effects on several measures of cross-race friendships, particularly on reductions in negative attitudes across race lines. Separate analyses by race suggest that these effects are due primarily to reductions of negative attitudes of white towards black students. Blacks' ratings of whites were not significantly different in the experimental and control conditions.

While some studies on the effects of cooperative learning methods report equal effects for children of different race, sex, and achievement level (Hansell and Slavin, 1981), others (Slavin and Oickle, 1981) found a similar race by treatment interaction for the effects of the Student Teams-Achievement Division (STAD) program, which contains the cooperative element of TAI but not individualized instruction. The question whether the racial



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mix of the population influenced the results or whether they were in part or totally due to a differential effect of the treatment on the different ethnic groups, cannot be answered at this point. Slavin (1979) found that the effects of cooperative learning in bi-racial teams was not significantly related to the racial proportions in the population. Rosenfield (1981) found that in integrated situations the number of other-race friends for whites increased with a higher proportion of minority children. In our case the smaller number of white children, which reduces the number of possible choices of whites by blacks may have reduced the power of the statistical analysis for this subsample.

The main effects for cross-race choices, friendship as well as rejections, support earlier findings that a variety of cooperative learning methods have positive effects on race relations (DeVries, Edwards and Slavin, 1977; Slavin, 1979).*

For measures of cross-sex attitudes, the only significant effects were a reduction by the TAI treatment of the number of other-race peers rated as "not nice." These results provide only partial support for an earlier finding of increased cross-sex friendships as a result of a cooperative learning intervention (DeVries and Edwards, 1974). As in the DeVries and Edwards study, we found that cross-race choices were both more rare at pretest and more difficult to change than cross-race choices.

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*Contrary to findings of Carter et al. (1980) that academic acceptance tends to be greater in schools than social acceptance, this study found treatment effects for ratings on a social dimension (niceness). Children's cross-race and cross-sex ratings of peers on an academic dimension were not affected by the TAI treatment.



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The present study reveals a pattern of greater effects of the cooperative treatment on a reduction of negative attitudes than on an increase in positive ones. It supports similar findings in two earlier studies, one with mainstreamed students (Madden and Slavin, in press) and one which examined the effects of cooperative techniques on the social interactions between Hispanic- and Anglo-American students (Tackaberry, 1980). In a previous study of TAI (Slavin, Madden and Leavey, 1982), effects of the treatment were found for both increased friendship choices and decreased rejections of mainstreamed students by their normal-progress classmates.

It is obvious from the results of the present study that the cooperative component of the TAI technique is not significantly weakened by the inclusion of an individualized component. The fact that a treatment like TAI which is relatively low in interdependence (because of its use of individualized curriculum materials) and which was offered only for one hour a day over a four month period produced similar positive socializing effects as cooperative programs without the individualized aspect (Slavin, 1979; Slavin and Oickle, 1981) confirms the importance of promoting opportunities for frequent close interactions under a cooperative incentive structure, which TAI has in common with other cooperative techniques.


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Table 1

Analysis of Covariance of Sociometric Measures across Race

| Measure | TAI | | | | Control | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Pretest | | Posttest | | Pretest | | Posttest | | | |
| | M | SD | M | SD | M | SD | M | SD | F | p |
| In-class friends* | 0.20 | 0.19 | 0.28 | 0.20 | 0.17 | 0.18 | 0.20 | 0.20 | 3.965 | .048 |
| In-class rejects** | 0.26 | 0.26 | 0.23 | 0.20 | 0.23 | 0.21 | 0.34 | 0.23 | 18.233 | .000 |
| Rating Scales: | | | | | | | | | | |
| very nice* | 0.31 | 0.23 | 0.30 | 0.24 | 0.30 | 0.23 | 0.27 | 0.21 | 0.993 | ns |
| not nice** | 0.21 | 0.22 | 0.18 | 0.20 | 0.24 | 0.23 | 0.27 | 0.21 | 6.148 | .014 |
| very smart* | 0.26 | 0.26 | 0.27 | 0.26 | 0.22 | 0.22 | 0.22 | 0.26 | 0.973 | ns |
| not smart** | 0.17 | 0.23 | 0.18 | 0.23 | 0.19 | 0.19 | 0.25 | 0.22 | 2.852 | ns |

*Higher values indicate more positive ratings

**Higher values indicate more negative ratings

N for TAI group = 83

N for Control group = 77





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Table 2

Analysis of Covariance of Sociometric Measures across Sex

| Measure | TAI | | | | Control | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Pretest | | Posttest | | Pretest | | Posttest | | | |
| | M | SD | M | SD | M | SD | M | SD | F | p |
| In-class friends* | 0.11 | 0.14 | 0.17 | 0.15 | 0.16 | 0.14 | 0.21 | 0.15 | 0.018 | ns |
| In-class rejects** | 0.32 | 0.23 | 0.33 | 0.24 | 0.26 | 0.18 | 0.33 | 0.22 | 2.741 | ns |
| Rating Scales. | | | | | | | | | | |
| very nice* | 0.24 | 0.22 | 0.24 | 0.22 | 0.31 | 0.21 | 0.28 | 0.18 | 0.531 | ns |
| not nice** | 0.25 | 0.21 | 0.21 | 0.21 | 0.18 | 0.17 | 0.24 | 0.18 | 14.249 | .000 |
| very smart* | 0.25 | 0.25 | 0.27 | 0.28 | 0.21 | 0.19 | 0.25 | 0.22 | 0.066 | ns |
| not smart** | 0.16 | 0.17 | 0.18 | 0.20 | 0.1[illegible] | 0.17 | 0.22 | 0.22 | 1.910 | ns |

*Higher values indicate more positive ratings

**Higher values indicate more negative ratings

N for TAI group = 83

N for Control group = 77





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Table 3

Rating Scales

Analysis of Covariance of Cross-Race and Cross-Sex Choices Received by Black Students

| Scale | TAI | | | | Control | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Pretest | | Posttest | | Pretest | | Posttest | | | |
| | M | SD | M | SD | M | SD | M | SD | F | p |
| 1. Cross-race | | | | | | | | | | |
| Very nice | 0.27 | 0.23 | 0.27 | 0.23 | 0.25 | 0.24 | 0.23 | 0.21 | 0.570 | ns |
| Not nice | 0.25 | 0.24 | 0.18 | 0.22 | 0.31 | 0.25 | 0.32 | 0.22 | 8.328 | .005 |
| Very smart | 0.21 | 0.26 | 0.25 | 0.24 | 0.23 | 0.22 | 0.20 | 0.26 | 1.532 | ns |
| Not smart | 0.21 | 0.27 | 0.22 | 0.25 | 0.22 | 0.20 | 0.28 | 0.23 | 2.566 | ns |
| 2. Cross-Sex | | | | | | | | | | |
| Very nice | 0.25 | 0.23 | 0.23 | 0.21 | 0.31 | 0.23 | 0.27 | 0.19 | 0.018 | ns |
| Not nice | 0.25 | 0.22 | 0.20 | 0.21 | 0.20 | 0.17 | 0.27 | 0.19 | 14.960 | .000 |
| Very smart | 0.21 | 0.26 | 0.24 | 0.28 | 0.20 | 0.19 | 0.23 | 0.19 | 0.000 | ns |
| Not smart | 0.19 | 0.18 | 0.22 | 0.22 | 0.18 | 0.18 | 0.24 | 0.23 | 1.298 | ns |

N for TAI group = 54

N for Control group = 52



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Table 4

Rating Scales

Analysis of Covariance of Cross-Race and Cross-Sex Choices Received by White Students

| | TAI | | | | Control | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Pretest | | Posttest | | Pretest | | Posttest | | | |
| Scale | M | SD | M | SD | M | SD | M | SD | F | p |
| 1. Cross-race | | | | | | | | | | |
| Very nice | 0.37 | 0.21 | 0.37 | 0.25 | 0.39 | 0.19 | 0.34 | 0.18 | 0.427 | ns |
| Not nice | 0.12 | 0.16 | 0.16 | 0.16 | 0.13 | 0.12 | 0.15 | 0.13 | 0.040 | ns |
| Very smart | 0.34 | 0.24 | 0.31 | 0.28 | 0.26 | 0.22 | 0.25 | 0.26 | 0.003 | ns |
| Not smart | 0.08 | 0.12 | 0.11 | 0.15 | 0.15 | 0.15 | 0.17 | 0.18 | 0.081 | ns |
| 2. Cross-sex | | | | | | | | | | |
| Very nice | 0.23 | 0.21 | 0.29 | 0.25 | 0.32 | 0.17 | 0.30 | 0.17 | 1.354 | ns |
| Not nice | 0.23 | 0.21 | 0.22 | 0.22 | 0.14 | 0.15 | 0.19 | 0.16 | 1.206 | ns |
| Very smart | 0.32 | 0.22 | 0.33 | 0.27 | 0.24 | 0.20 | 0.29 | 0.26 | 0.282 | ns |
| Not smart | 0.12 | 0.13 | 0.12 | 0.16 | 0.16 | 0.14 | 0.18 | 0.20 | 0.528 | ns |

N for TAI group = 29

N for Control group = 25





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